# Expansion of Ipswich

## comparative costs

A supplementary report to the Minister of Housing and Local Government
by Shankland, Cox and Associates

London Her Majesty's Stationery Office 1968

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**To:**
**The Right Honourable Anthony Greenwood, MP,**
**Minister of Housing and Local Government**

Our report *Expansion of Ipswich: designation proposals* was submitted to your predecessor in June 1966, and published by HMSO in September 1966. It recommended that Ipswich should expand on the west and south-west of the existing town. In the ensuing discussions some concern was expressed that our proposal entailed building on good agricultural land west of Ipswich rather than on poorer land to the east. You commissioned us to examine certain alternatives, with particular reference to their demands on agricultural land and their comparative costs. We now have the honour to submit our supplementary report. This additional study has strengthened our conviction that the designation proposals in our first report would provide the soundest and most economical form for the expansion of Ipswich.

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July, 1967

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# 1 Introduction

In chapter 5 of *Expansion of Ipswich: designation proposals* (referred to below as 'the first report') we considered various directions in which Ipswich might expand, and compared each of the alternatives with the social and economic objectives of expansion set out in chapter 3. Our conclusion was: "There are clear advantages in establishing a band of development to the west of Ipswich. The costs of expansion are likely to be lower and the social and economic benefits greater than with expansion on the east".

The first report did not include estimates of the financial advantages of expansion on the west. The object of the studies described in this volume was to examine certain alternatives, with particular reference to their demands on agricultural land and their comparative costs. We have therefore attempted to assess the cost of agricultural land and the loss of farm output, along with capital and recurrent costs of those items in the development which are likely to reveal major differentials. These major items are communications and drainage and they may be costed with some precision.

For this purpose seven alternative hypothetical forms for the expansion of Ipswich have been considered. These are not seven different plans, but simply theoretical diagrams locating the expansion areas and main roads with sufficient precision to enable broad estimates of cost to be made.

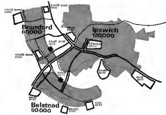
Alternative 1 is that proposed in our first report. The other six alternatives all include some expansion both east and west of Ipswich. The alternative of all expansion to the east has not been considered. There would be a delay of about five years before an expansion area on the east could be provided with a sewerage system, whereas expansion on the west could make use of existing spare capacity. It is therefore essential for expansion to start on the west if 70,000 people are to be brought to Ipswich by 1981, as proposed in our terms of reference. In order to support a district centre, the expansion area on the west should be planned for an ultimate population of at least 40,000, though 60,000 would be preferable.

The seven alternatives are shown in figure 1. They may be briefly described as follows--

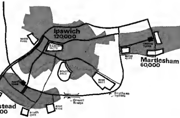
1 Districts of 60,000 population at Belstead and Bramford.
2 Districts of 60,000 population at Belstead and Martlesham with a southern by-pass including a bridge over the Orwell estuary (East Suffolk County Council proposal).
3 Districts of 60,000 population at Belstead and Martlesham with a northern by-pass.
4 Districts of 60,000 population at Bramford and Martlesham with a northern by-pass.
5 Districts of 60,000 population at Belstead and Martlesham/Kesgrave with a northern by-pass. This assumes a position for the Martlesham district closer to Ipswich.
6 District of 40,000 population at Belstead and district of 80,000 at Martlesham with a northern by-pass.
7 Districts of 40,000 population at Belstead, Bramford and Martlesham.

Figure 2 shows the general position of each of the districts.

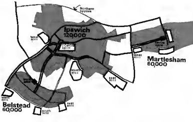
1 The alternative hypotheses



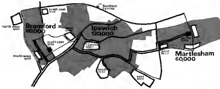
Hypothesis 1



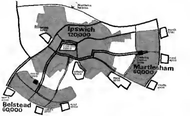
Hypothesis 2



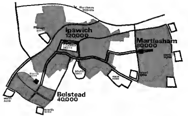
Hypothesis 3



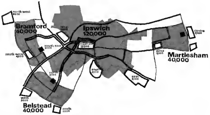
Hypothesis 4



**Hypothesis 5**



**Hypothesis 6**



**Hypothesis 7**

Key

▭ Employment zones

■ District centres

4000 Number of jobs

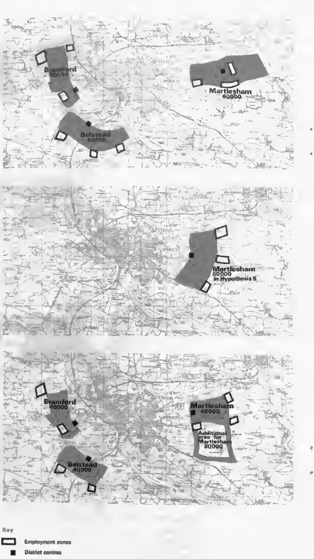
═══ Dual 3 lane road

━━ Dual 2 lane road

══ Single 3 lane road

── Single 2 lane road

2 Location of districts for comparative studies



# 2 Capital costs

Table 2.1 shows the capital items that have been costed for each alternative. Costs for road construction and drainage are not the total costs of expansion since items common to all proposals are excluded.

The estimates of road construction costs for each alternative are detailed in appendix A and the estimates for agricultural land acquisition costs are detailed in appendix B.

Because of the nature of the land form, the capital cost for drainage would be greater if any development were to the east of Ipswich. A considerable amount of sewage would need to be pumped if only one new sewage works were constructed to the east, and surface water drainage would require long lengths of culverting.

Table 2.2 lists the alternatives in order of total capital costs, including an additional £30 millions common to all the alternatives to cover the costs of roads for travel within each district and within existing Ipswich, and for through traffic.

**2.1 Capital cost of each alternative (less common items)**

| | Capital cost in £ thousands | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Road construction | 12,508 | 22,133 | 18,932 | 20,012 | 15,610 | 18,776 | 16,008 |
| Drainage | | | | | | | |
| i. Sewage works | 780 | 825 | 825 | 825 | 825 | 800 | 600 |
| ii. Foul and surface water drainage | 8,550 | 8,400 | 8,400 | 8,400 | 8,400 | 8,200 | 8,000 |
| | 18,818 | 31,358 | 28,157 | 29,237 | 24,835 | 27,776 | 24,608 |
| Acquisition of agricultural land | 2,040 | 1,634 | 1,634 | 1,634 | 1,670 | 1,538 | 1,884 |
| Total | 20,858 | 32,992 | 29,791 | 30,871 | 26,505 | 29,314 | 26,492 |

**2.2 Alternatives in order of capital cost**

| Alternatives in order of capital cost | Total cost of items considered in £ thousands | Additional cost over cheapest alternative in £ thousands |
|---|---|---|
| 1 | 50,858 | — |
| 7 | 56,492 | 5,634 |
| 5 | 56,505 | 5,647 |
| 6 | 59,314 | 6,456 |
| 3 | 59,791 | 8,933 |
| 4 | 60,871 | 10,013 |
| 2 | 62,992 | 12,134 |

# 3 Recurrent costs

One of the principal social and economic objectives outlined in chapter 3 of the first report was that employees should be able to take full advantage of the wider choice of occupation, industry and employer available in a larger town, and that employers should have a larger labour force to draw from. Consequently while there should be reasonable dispersal of employment so that some job is within walking distance of most people, it must be assumed that the whole of expanded Ipswich would be a single employment market, and movement between all parts of the town must be allowed for. This has been taken as a basic planning principle in studying the alternatives. The same principle of freedom of choice has also been assumed for non-work functions, such as shopping and recreation.

Alternatives 2 to 7, with part of the expansion to the east and part to the west, would lead to a more dispersed town with greater distances between the new districts. The total amount of travelling would be greater than in alternative 1. Table 3.1 shows, for each of the proposals, estimated annual vehicle miles for all purposes. The calculations and assumptions used to arrive at these figures are shown in appendix A.

This table shows that, compared with alternative 1, there is an increase in annual vehicle miles ranging from 20% in alternative 7 to 42% in alternative 3. The considerable extra mileage arises for two reasons. Firstly, the residential areas in the Martlesham district are further from the employment zones of existing Ipswich than are either Bramford or Belstead districts; and secondly, with Martlesham as one of the districts, the inter-district distance would be considerably greater than between Bramford and Belstead.

**3.1 Annual vehicle miles for each alternative**

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| Annual vehicle miles in million miles (n=1.0—see appendix A) | 148 275 | 205 182 | 212.466 | 207.623 | 183.870 | 202 986 | 180 621 |

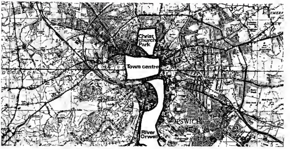
**3.2 Peak-hour cross-town movement for each alternative**

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| Peak-hour movement across Ipswich in p.c.u s (where n=1.0) | 1300 | 2570 | 2590 | 2430 | 2610 | 2550 | 2600 |

**3.3 Recurrent costs of each alternative**

| | Annual cost in £ thousands | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Vehicular travel | 4,354 | 5,964 | 6,196 | 6,060 | 5,383 | 5,919 | 5,268 |
| Road maintenance | 48 | 66 | 65 | 64 | 60 | 66 | 65 |
| Accidents | 234 | 289 | 327 | 309 | 305 | 309 | 297 |
| Drainage— | | | | | | | |
| i Sewage works | 55 | 70 | 70 | 70 | 70 | 73 | 70 |
| ii Foul and surface water drainage | 100 | 185 | 166 | 165 | 165 | 155 | 150 |
| | 4,791 | 6,574 | 6,825 | 6,668 | 5,883 | 6,522 | 5,850 |
| Plus annual gross value of lost agricultural output | 408 | 281 | 281 | 281 | 281 | 251 | 306 |
| Total | 5,199 | 6,855 | 7,106 | 6,949 | 6,164 | 6,773 | 6,156 |

3 Barriers to east-west vehicular movement



One important consequence of having districts on both sides of Ipswich is that the amount of east-west travel across the existing town would be increased. The figures in table 3.2 include inter-district travel and travel from districts to existing Ipswich employment zones. They do not include traffic with a town centre destination. These figures show that for alternatives 2 to 7 there is almost twice as much cross-town movement as for alternative 1, necessitating at least one additional traffic lane and possibly two. With the River Orwell, the town centre, and Christchurch Park all forming formidable barriers, as shown on figure 3, it is advisable to keep to a minimum the additional east-west movement generated by the proposed expansion.

The volume of travel shown in table 3.1 has been costed and estimates have also been made of road maintenance costs and the cost of accidents. These are shown in table 3.3.

Estimates have been made of the approximate annual maintenance and running costs of the drainage system for each of the proposals and these figures are also shown in table 3.3.

The assumptions used to estimate the vehicular travel costs, road maintenance costs and accident costs are shown in appendix A and estimates of annual agricultural production are shown in appendix B.

Table 3.4 lists the alternatives in order of total recurrent costs.

**3.4 Alternatives in order of recurrent cost**

| Alternatives in order of recurrent cost | Recurrent annual cost in £ thousands | Additional cost over cheapest alternative in £ thousands |
|---|---|---|
| 1 | 5,199 | — |
| 7 | 6,156 | 957 |
| 5 | 6,184 | 985 |
| 6 | 6,773 | 1,574 |
| 2 | 6,855 | 1,656 |
| 4 | 6,949 | 1,750 |
| 3 | 7,106 | 1,907 |

# 4 Loss of agricultural land

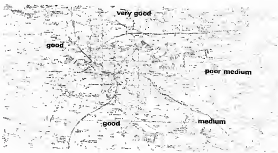
Estimates of the amount of agricultural land taken for each proposal are given in the table 4.1. This table shows the agricultural land divided into good quality and medium quality.

With improved farming techniques, differences in quality of agricultural land will become less important, so the most significant figures in table 4.1 are the total agricultural land taken for each proposal.

**4.1 Agricultural land for each alternative**

| | Agricultural land taken in acres | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Good quality | 6,800 | 3,400 | 3,400 | 3,400 | 3,400 | 2,200 | 4,400 |
| Medium quality | — | 2,200 | 2,200 | 2,200 | 2,500 | 3,400 | 1,200 |
| Total | 8,800 | 5,600 | 5,600 | 5,600 | 5,900 | 5,600 | 5,600 |

4 Quality of agricultural land



# 5 Conclusions

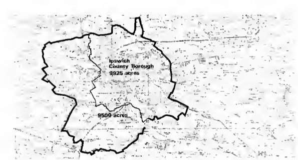
i Alternative 1 shows the lowest capital costs and recurrent costs.

ii Alternative 7, which has the next lowest costs, would require 1,200 acres less agricultural land than alternative 1, but would present some serious planning problems. Each district of 40,000 population would require a district centre if the planning aims outlined in the first report are to be achieved. Three district centres would be more expensive than two even though the total population to be served would be the same It is doubtful whether a district of 40,000 would support the same level of shopping and services as a district of 60,000. In this event, pressure to use the town centre would be much greater, leading either to greater congestion, or to the construction of larger roads and more car parks which would destroy many of the historic and architectural building groups and alter the scale and character of the heart of Ipswich.

The programming of three districts would also be difficult. If they were built simultaneously, none would reach 40,000 population until after 1981 and it is doubtful whether district centres could be established at a lower population. If development up to 1981 were concentrated in two of the three districts, successful district centres might be established in those two, but the third district would take only subsequent natural increase and would therefore develop very slowly.

iii All the alternatives require a considerable acreage of agricultural land, with alternative 1 requiring the most at 6,800 acres. The minimum acreage required for other proposals, however, is 5,600 acres so that the amount of agricultural land required for the expansion would only be reduced by 1,200 acres if another alternative were preferred to alternative 1.

5 Area required for alternative 1



# Appendix A
# Road communications

### 1 Comparative transportation studies

The transportation studies were based on an assessment of vehicular work journeys between the new districts and Ipswich, for which purpose workers were assigned to various employment zones. The location of these employment zones and the number of jobs available are shown on figure 1. The assignment of workers to the zones was directly proportional to the number of jobs available and inversely proportional to the distance to be travelled.

The total daily vehicular flows for all trip purposes were calculated by extrapolating the total vehicular work journey movement by the ratio of total trips to work journey trips.

For the purposes of calculation certain basic assumptions have been used. These were agreed at a meeting with Ministry of Transport officials on 27th June, 1967.

a Shenkland Cox and Associates would establish the alternative hypotheses to be tested—land uses and populations, road network—relating to a post-1981 situation. These alternatives are shown on figure 1.

b The number of people economically active is assumed to be 43%, with each worker generating 2.2 work trips daily. This is equivalent to 1.0 work trips per head of population. It is assumed that 33% of jobs are found locally and do not involve a vehicular trip.

c The relationship between daily vehicular work trips and total daily trips by vehicle is that the latter is 2.4 times the former.

d Vehicular travel is to be determined in proportion to the number of jobs divided by distance, except in the case of travel between Belstead (or Bramford) and Martlesham, when, in addition, the effect of distance to the power of 1.5 is to be studied.

e A modal split for vehicular trips of 75% by private vehicle and 25% by public vehicle is to be used. The effect of a modal split of 60% by private vehicle and 40% by public vehicle is also to be studied.

f Person trips are to be converted to p.c.u. value by assuming 1.3 person trips by private vehicle = 1 p.c.u. and 30 person trips by bus = 3 p.c.u.s.

g Allowance is to be made for commercial traffic by weighting the p.c.u. value of person trips by 1.35.

h Annual trip mileage is assumed to be 300 times daily trip mileage.

i The mileage of inter-district trips is measured between zone centroids.

Using these assumptions, the origin and destination of journeys to work for each of the alternatives has been determined. This is shown in the following tables A1 to A7 which are based on a distance deterrent equal to the first power. The figures in brackets show the distribution when journeys between Martlesham and either Belstead or Bramford are inhibited by a distance deterrent to the power of 1.5.

## 2 Road mileage and vehicular miles travelled

The vehicular work journeys between the new districts and between Ipswich and the new districts were assigned to a road network for each of the alternatives. The road networks assumed are shown in figure 1. These journeys were converted to total daily flows for all purposes in passenger car units (p.c.u.s) making allowance for commercial vehicles and a modal split of 75% by private transport and 25% by public transport.

A separate study was done for each of the alternatives to consider the effect of a modal split of 60% by private transport and 40% by public transport. This resulted in every case in a reduction of approximately 15% in the flows. In the majority of cases this reduction was insufficient to change the dimensions of carriageways required on any individual link in the road network. It did, however, reduce the annual vehicle mileage by approximately 15% and resulted in a reduction in annual running costs and accidents. The reduction would apply to all the proposals being considered and while the differences in recurrent costs would be smaller, this would not effect the position of the alternatives in order of recurrent costs.

The daily flows on various lengths of the road network for each alternative have been converted into road widths and these are shown in table A9. Allowance has been made in the road widths for external traffic either starting or terminating in Ipswich.

## 3 Estimation of capital cost for road construction

Using the road lengths for each proposal shown in table A9, the capital costs for road construction have been estimated. These are shown in table A11, along with the assumed cost per mile for construction or improvement of each type of road. In alternative 2 the cost of the southern by-pass and the crossing of the River Orwell is shown as a separate item.

## 4 Estimation of recurrent costs

The following assumptions have been used in estimating the annual costs for vehicle mileage, road maintenance and accidents. These were agreed at a meeting with Ministry of Transport officials on 27th June, 1967.

a The cost of vehicular travel is to be taken at 7d per mile.

b Annual costs for road maintenance are to be taken as £1,500 per mile for dual carriageway roads and £800 per mile for single carriageway roads.

c The accident rate for personal injury accidents is to be taken as

2.6 P.I. accidents per million miles travelled on single carriageway roads.

1.6 P.I. accidents per million miles travelled on dual carriageway roads.

0.9 P.I. accidents per million miles travelled on motorway type roads.

d The average cost of a personal injury accident can be taken as £1,000.

Using the figures for total annual vehicular mileage in table A10, the annual travel cost has been estimated for each alternative and this is shown in table A12.

Again using the figures for annual vehicular mileage, the accident cost for each proposal has been estimated and shown in table A13.

The annual road maintenance costs for each proposal have been estimated for the road lengths of the various types shown in table A9. These costs are summarised in table A14.

**A1 Distribution of vehicular work trips—alternative 1**

| Origin of vehicular work trips | Workplace destinations of vehicular work trips in thousands | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Ipswich | | | | Bramford | | | | Belstead | | | | Martlesham | |
| | West | South | East | Town Centre | North west | North east | South west | South east | North | South | East | West | West | Centre |
| Ipswich | 2.38 | 2.38 | 2.38 | 11.92 | 2.88 | 0.33 | 3.57 | 2.38 | 2.00 | 1.28 | 1.57 | 2.86 | — | — |
| Bramford | 1.84 | 0.92 | 0.61 | 5.09 | 2.20 | 0.36 | 2.20 | 1.10 | 0.92 | 0.55 | 0.73 | 1.56 | — | — |
| Belstead | 1.05 | 0.93 | 0.59 | 5.08 | 1.02 | 0.11 | 2.04 | 0.71 | 1.02 | 1.02 | 1.38 | 2.04 | — | — |

**A2 Distribution of vehicular work trips—alternative 2**

| Origin of vehicular work trips | Workplace destinations of vehicular work trips in thousands | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Ipswich | | | | Bramford | | | | Belstead | | | | Martlesham | |
| | West | South | East | Town Centre | North west | North east | South west | South east | North | South | East | West | West | Centre |
| Ipswich | 2.62 | 2.62 | 2.62 | 13.10 | — | — | — | — | 2.20 | 1.41 | 1.72 | 3.14 | 2.09 | 4.45 |
| | (2.62) | (2.62) | (2.62) | (13.10) | | | | | (2.20) | (1.41) | (1.72) | (3.14) | (2.09) | (4.45) |
| Belstead | 1.21 | 1.07 | 0.68 | 5.99 | — | — | — | — | 1.17 | 1.17 | 1.68 | 2.34 | 0.49 | 1.17 |
| | (1.32) | (1.17) | (0.74) | (7.57) | | | | | (1.27) | (1.27) | (1.70) | (2.55) | (0.13) | (0.28) |
| Martlesham | 0.78 | 0.78 | 1.26 | 5.25 | — | — | — | — | 0.37 | 0.35 | 0.55 | 0.55 | 2.02 | 6.00 |
| | (0.85) | (0.85) | (1.37) | (5.72) | | | | | (0.08) | (0.08) | (0.14) | (0.11) | (2.20) | (6.60) |

**A3 Distribution of vehicular work trips—alternative 3**

| Origin of vehicular work trips | Workplace destinations of vehicular work trips in thousands | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Ipswich | | | | Bramford | | | | Belstead | | | | Martlesham | |
| | West | South | East | Town Centre | North west | North east | South west | South east | North | South | East | West | West | Centre |
| Ipswich | 2.51 | 2.51 | 2.51 | 12.55 | — | — | — | — | 2.20 | 1.41 | 1.72 | 3.14 | 2.00 | 4.28 |
| | (2.51) | (2.51) | (2.51) | (12.55) | | | | | (2.20) | (1.41) | (1.72) | (3.14) | (2.00) | (4.26) |
| Belstead | 1.21 | 1.07 | 0.68 | 6.99 | — | — | — | — | 1.17 | 1.17 | 1.56 | 2.34 | 0.49 | 1.17 |
| | (1.32) | (1.18) | (0.74) | (7.57) | | | | | (1.28) | (1.28) | (1.69) | (2.64) | (0.13) | (0.27) |
| Martlesham | 0.78 | 0.78 | 1.28 | 5.25 | — | — | — | — | 0.38 | 0.35 | 0.49 | 0.58 | 2.02 | 6.05 |
| | (0.85) | (0.85) | (1.37) | (5.20) | | | | | (0.06) | (0.08) | (0.11) | (0.16) | (2.20) | (6.60) |

**A4 Distribution of vehicular work trips—alternative 4**

| Origin of vehicular work trips | Workplace destinations of vehicular work trips in thousands | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Ipswich | | | | Bramford | | | | Belstead | | | | Martlesham | |
| | West | South | East | Town Centre | North west | North east | South west | South east | North | South | East | West | West | Centre |
| Ipswich | 2.51 | 2.51 | 2.51 | 12.55 | 3.01 | 0.35 | 3.75 | 2.51 | — | — | — | — | 2.00 | 4.26 |
| | (2.51) | (2.51) | (2.51) | (12.55) | (3.01) | (0.35) | (3.75) | (2.51) | | | | | (2.00) | (4.26) |
| Bramford | 2.15 | 1.01 | 0.70 | 5.95 | 2.58 | 0.43 | 2.58 | 1.29 | — | — | — | — | 0.40 | 1.03 |
| | (2.30) | (1.18) | (0.77) | (6.35) | (2.75) | (0.48) | (2.75) | (1.37) | | | | | (0.09) | (0.23) |
| Martlesham | 0.78 | 0.78 | 1.26 | 5.26 | 0.68 | 0.13 | 0.65 | 0.30 | — | — | — | — | 2.02 | 6.08 |
| | (0.82) | (0.82) | (1.33) | (6.07) | (0.18) | (0.03) | (0.16) | (0.08) | | | | | (2.13) | (6.40) |

**A5 Distribution of vehicular work trips—alternative 5**

| Origin of vehicular work trips | Workplace destinations of vehicular work trips in thousands | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Ipswich | | | | Bramford | | | | Belstead | | | | Martlesham | | | |
| | West | South | East | Town Centre | North west | North east | South west | South east | North | South | East | West | District Centre | North | East | South |
| Ipswich | 2.53 | 2.53 | 2.53 | 12.68 | — | — | — | — | 2.13 | 1.37 | 1.69 | 3.04 | 1.69 | 2.53 | 1.69 | 1.69 |
| | (2.53) | (2.53) | (2.53) | (12.68) | | | | | (2.13) | (1.37) | (1.69) | (3.04) | (1.69) | (2.53) | (1.69) | (1.69) |
| Belstead | 1.31 | 1.09 | 0.55 | 7.05 | — | — | — | — | 1.18 | 1.18 | 1.48 | 2.38 | 0.36 | 0.46 | 0.40 | 0.43 |
| | (1.41) | (1.17) | (0.60) | (7.62) | | | | | (1.28) | (1.28) | (1.71) | (2.56) | (0.09) | (0.11) | (0.09) | (0.11) |
| Martlesham | 0.75 | 1.05 | 1.74 | 5.85 | — | — | — | — | 0.40 | 0.31 | 0.48 | 0.63 | 1.28 | 2.10 | 1.58 | 1.88 |
| | (0.82) | (1.14) | (1.90) | (8.35) | | | | | (0.11) | (0.07) | (0.09) | (0.16) | (1.37) | (2.29) | (1.83) | (1.83) |

**A6 Distribution of vehicular work trips—alternative 6**

| Origin of vehicular work trips | Workplace destinations of vehicular work trips in thousands | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Ipswich | | | | Bramford | | | | Belstead | | | Martlesham | |
| | West | South | East | Town Centre | North west | North east | South west | South east | North | South | West | West | Centre |
| Ipswich | 2.55 | 2.55 | 2.55 | 13.0 | — | — | — | — | 2.24 | 1.40 | 2.08 | 4.18 | 5.22 |
| | (2.55) | (2.55) | (2.55) | (13.0) | | | | | (2.24) | (1.40) | (2.08) | (4.18) | (5.22) |
| Belstead | 0.89 | 0.86 | 0.52 | 5.12 | — | — | — | — | 0.86 | 0.86 | 1.15 | 0.72 | 1.01 |
| | (1.00) | (0.87) | (0.58) | (8.75) | | | | | (0.97) | (0.97) | (1.29) | (0.19) | (0.26) |
| Martlesham | 1.15 | 1.15 | 1.95 | 8.00 | — | — | — | — | 0.51 | 0.48 | 0.81 | 3.87 | 8.40 |
| | (1.21) | (1.21) | (2.09) | (8.43) | | | | | (0.18) | (0.11) | (0.14) | (3.88) | (8.75) |

**A7 Distribution of vehicular work trips—alternative 7**

| Origin of vehicular work trips | Workplace destinations of vehicular work trips in thousands | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Ipswich | | | | Bramford | | | Belstead | | | Martlesham | |
| | West | South | East | Town Centre | North west | South west | South east | North | South | West | West | Centre |
| Ipswich | 2.50 | 2.50 | 2.50 | 12.50 | 2.00 | 1.85 | 2.50 | 2.10 | 1.35 | 2.00 | 1.50 | 2.50 |
| | (2.50) | (2.50) | (2.50) | (12.50) | (2.00) | (1.85) | (2.50) | (2.10) | (1.35) | (2.00) | (1.50) | (2.50) |
| Bramford | 1.43 | 0.71 | 0.47 | 3.98 | 1.18 | 0.88 | 0.68 | 0.71 | 0.43 | 0.81 | 0.20 | 0.40 |
| | (1.49) | (0.74) | (0.49) | (4.11) | (1.18) | (0.89) | (0.89) | (0.74) | (0.45) | (0.88) | (0.04) | (0.09) |
| Belstead | 0.82 | 0.74 | 0.49 | 4.71 | 0.53 | 0.79 | 0.57 | 0.79 | 0.79 | 1.05 | 0.25 | 0.46 |
| | (0.86) | (0.78) | (0.50) | (4.95) | (0.55) | (0.83) | (0.60) | (0.83) | (0.83) | (1.11) | (0.05) | (0.11) |
| Martlesham | 0.62 | 0.73 | 1.08 | 4.34 | 0.33 | 0.28 | 0.28 | 0.28 | 0.28 | 0.31 | 1.04 | 2.43 |
| | (0.70) | (0.82) | (1.21) | (4.89) | (0.08) | (0.05) | (0.08) | (0.08) | (0.08) | (0.08) | (1.17) | (2.74) |

It is difficult to put a precise value on the distance deterrent, but it is known to lie between the powers of 0 and 2 for various journey lengths and purposes. The effect of using different distance deterrents is shown in A8 where values for the distance deterrent of 0, 1 and 1.5 have been used in a study of alternative 3. Studies we have made in Ipswich suggest that the deterrent factor is at present well under 1 for work journeys, and in our view, a factor of 1 is likely to apply in the larger expanded town.

**A8 Distribution of vehicular work trips for alternative 3 using different distance deterrents**

| Origin of vehicular work trips | Distance deterrent (n) | Workplace destinations of vehicular work trips in thousands | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Ipswich | | | | Belstead | | | | Martlesham | |
| | | West | South | East | Town Centre | North | South | East | West | West | Centre |
| Ipswich | 0 | 2.50 | 2.50 | 2.60 | 12.50 | 1.60 | 1.50 | 2.00 | 3.00 | 2.00 | 6.00 |
| | 1 | 2.62 | 2.62 | 2.62 | 13.10 | 2.20 | 1.41 | 1.72 | 3.14 | 2.09 | 4.45 |
| | 1.5 | 2.62 | 2.62 | 2.62 | 13.10 | 2.20 | 1.41 | 1.72 | 3.14 | 2.09 | 4.45 |
| Belstead | 0 | 1.25 | 1.25 | 1.25 | 6.25 | 0.75 | 0.75 | 1.00 | 1.50 | 1.00 | 3.00 |
| | 1 | 1.21 | 1.07 | 0.66 | 6.88 | 1.17 | 1.17 | 1.56 | 2.34 | 0.49 | 1.17 |
| | 1.5 | 1.32 | 1.17 | 0.74 | 7.57 | 1.27 | 1.27 | 1.70 | 2.55 | 0.13 | 0.25 |
| Martlesham | 0 | 1.25 | 1.25 | 1.25 | 6.25 | 0.75 | 0.75 | 1.00 | 1.50 | 1.00 | 3.00 |
| | 1 | 0.76 | 0.76 | 1.26 | 6.26 | 0.37 | 0.35 | 0.55 | 0.65 | 2.02 | 6.00 |
| | 1.5 | 0.85 | 0.85 | 1.37 | 6.72 | 0.08 | 0.06 | 0.14 | 0.11 | 2.20 | 6.60 |

Where a distance deterrent of 1.5 has been used in this Table, it has been applied only to travel between Belstead and Martlesham. For travel between either Belstead or Martlesham and Ipswich a distance deterrent of 1.0 has been used.

**A9 Road lengths for each alternative**

| Type of road | Road lengths in miles | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Dual 3 lane—rural | 60 | — | .60 | 1.00 | .50 | .60 | — |
| Dual 3 lane—urban | 3.35 | 2.80 | 5.45 | 6.25 | 3.30 | 3.20 | 3.35 |
| Dual 3 lane—rural improvement | 3.10 | 1.55 | 2.00 | 2.00 | 2.00 | 2.00 | 3.00 |
| Dual 3 lane—urban improvement | — | 2.45 | 3.05 | 4.95 | 4.65 | 4.65 | 5.40 |
| Dual 2 lane—rural | 3.80 | 4.55 | 4.10 | 6.15 | 3.70 | 3.80 | 6.20 |
| Dual 2 lane—urban | 2.60 | 2.55 | 3.85 | 2.30 | 3.40 | 7.50 | — |
| Dual 2 lane—rural improvement | 2.80 | 4.25 | 4.25 | — | 4.25 | 4.25 | — |
| Dual 2 lane—urban improvement | 3.60 | 6.75 | 10.45 | 11.15 | 7.45 | 11.60 | 11.25 |
| Single 3 lane—rural | — | — | .20 | — | .20 | — | — |
| Single 3 lane—urban | 3.20 | — | 1.50 | 2.70 | 1.00 | 2.20 | 1.30 |
| Single 3 lane rural improvement | — | — | — | — | — | — | — |
| Single 3 lane—urban improvement | — | — | 2.00 | — | 3.75 | — | .60 |
| Single 2 lane—rural | 3.30 | .40 | 4.85 | .45 | 6.25 | 4.65 | 2.60 |
| Single 2 lane—urban | 6.80 | 5.70 | 7.60 | 3.65 | 7.70 | 4.70 | 13.40 |
| Single 2 lane—rural improvement | — | — | — | 80 | — | — | .30 |
| Single 2 lane—urban improvement | 6.90 | 8.55 | 2.80 | 5.80 | 2.10 | .60 | 7.70 |
| Southern by-pass | — | 9.90 | — | — | — | — | — |

The assignment of journeys to the road network and road lengths in the network were used to arrive at total daily vehicular mileage for each alternative. Table A10 shows annual vehicle mileage for all trip purposes on the various types of roads. These figures do not include external traffic.

### A10 Annual vehicle miles for each alternative

| Type of road | Annual vehicle miles in thousands | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Motorway | 46,402 | 78,677 | 86,938 | 76,828 | 42,401 | 57,971 | 45,360 |
| Dual Carriageway | 76,277 | 108,080 | 111,908 | 100 845 | 101,140 | 119 844 | 93 657 |
| Single Carriageway | 27,696 | 18,405 | 33,639 | 30,152 | 40,328 | 25 140 | 41,604 |
| Total | 149,276 | 206,162 | 212,486 | 207,823 | 183 870 | 202,958 | 180,621 |

### A11 Capital cost of roads for each alternative

| Type of road | Capital cost of roads in £ thousands | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Dual 3 lane (rural) | 600 0 | — | 450.0 | 750 0 | 450.0 | 450 0 | — |
| Dual 3 lane (urban) | 3,350 0 | 2,800 0 | 5,450 0 | 6,260 0 | 3 300 0 | 3,200.0 | 3,350 0 |
| Dual 3 lane (rural improvement) | 465 0 | 232 8 | 300 0 | 300 0 | 300 0 | 300.0 | 450 0 |
| Dual 3 lane (urban improvement from dual 2 lane) | — | 612 5 | 762.5 | 1,237 5 | 1,162.5 | 1,212 5 | 1,360 0 |
| Dual 2 lane (rural) | 1,710.0 | 2,047 5 | 1,845 0 | 3,557.5 | 1,865.0 | 1,820.0 | 2,750 0 |
| Dual 2 lane (urban) | 1,430 0 | 1,402.5 | 2,117 6 | 1,285 0 | 1,970 0 | 4,125.0 | — |
| Dual 2 lane (rural improvement) | 700 0 | 1,062.6 | 1,062.5 | — | 1,062.6 | 1,062 6 | — |
| Dual 2 lane (urban improvement) | 1,575 0 | 3,937 5 | 4,702.5 | 6,017.5 | 3,352 6 | 6,220.0 | 5,062.5 |
| Single 3 lane (rural) | — | — | 31.0 | — | 31.0 | — | — |
| Single 3 lane (urban) | 582 0 | — | 277 5 | 503 5 | 185 0 | 186 0 | 185 0 |
| Single 3 lane (rural improvement) | — | — | — | — | — | — | — |
| Single 3 lane (urban improvement) | — | — | 240.0 | — | 450 0 | — | 120 0 |
| Single 2 lane (rural) | 348 5 | 42.0 | 519 7 | 47 2 | 551 2 | 819 7 | 273.0 |
| Single 2 lane (urban) | 1,187.5 | 712.6 | 860 0 | 456.2 | 862.5 | 587.5 | 1,675.0 |
| Single 2 lane (rural improvement) | — | — | — | 84 0 | — | — | 18 0 |
| Single 2 lane (urban improvement) | 852.0 | 684 0 | 224 0 | 464 0 | 168 0 | 72.0 | 616 0 |
| Southern by-pass | — | 8,800 0 | — | — | — | — | — |
| Total | 12,506 0 | 22,133 5 | 18,332 2 | 20,012 4 | 15,810 2 | 18,776.2 | 16,006.0 |

### A12 Annual vehicle running costs for each alternative

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| Annual vehicle running cost in £ thousands | 4,354 | 8,984 | 6,198 | 6,060 | 5,363 | 5,918 | 5,268 |

### A13 Annual accident costs for each alternative

| Type of road | Annual accident costs in £ thousands | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Motorway | 41.7 | 71.7 | 60 2 | 69 1 | 38.2 | 52.2 | 39.0 |
| Dual carriageway | 120.4 | 174 5 | 179.0 | 161.3 | 161.8 | 191 7 | 149.8 |
| Single carriageway | 71.7 | 42.8 | 87 5 | 78.4 | 104.8 | 65 4 | 108.2 |
| Total | 233.8 | 288 8 | 326.7 | 308.8 | 304.8 | 308.3 | 297.0 |

### A14 Annual road maintenance costs for each alternative

| Type of road | Annual road maintenance costs in £ thousands | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Dual carriageway | 29.925 | 55.200 | 50.626 | 53.700 | 44.025 | 56 400 | 43.800 |
| Single carriageway | 18.320 | 11.720 | 15.240 | 10 800 | 16 000 | 10.200 | 21.200 |
| Total | 48.245 | 66 920 | 65.865 | 64.500 | 60 025 | 66.600 | 65 000 |

# Appendix B
# Agriculture

Table B1 gives an analysis of the existing land utilisation in the 9,500 acres outside Ipswich County Borough required for expansion in accordance with alternative 1. The area is shown in figure 5; it is smaller than that proposed for designation in the first report. Further work on the draft Basic Plan has shown that 9,500 acres would be sufficient. The figures are measured from a Land Utilisation Map for 1961.

The Bramford district is assumed to be all the expansion area north of the A12 trunk road and Belstead district is assumed to be all the expansion area south of the A12. The table shows that the amount of agricultural land taken for the Bramford district is approximately 3,400 acres. A similar acreage of agricultural land is required for the Belstead district.

In alternatives 2, 3 and 4, approximately 1,300 acres of the Martlesham district would be uncultivated land and 2,200 acres would be productive land, but of a poorer quality than at Bramford or Belstead. In alternative 5, approximately 1,000 acres would be uncultivated land and 2,500 acres would be productive land. In alternative 6, approximately 2,200 acres of agricultural land would be required for a district of 40,000 population at Belstead, and for a district of 80,000 population at Martlesham, 1,300 acres would be uncultivated land and 3,400 acres would be productive agricultural land. For alternative 7 approximately 4,400 acres of agricultural land would be required for districts of 40,000 population at Belstead and Bramford, while a district of 40,000 at Martlesham would require 1,200 acres of cultivated land and 1,000 acres of uncultivated land.

The cost of acquisition of agricultural land would be of the order of £300 per acre, including disturbance, for land at Belstead and Bramford and £220 per acre, including disturbance, for land at Martlesham. Uncultivated land at Martlesham would cost £100 per acre. The cost of acquisition for agricultural land, whether cultivated or uncultivated, is shown in table B.2. It is assumed that the cost of non-agricultural land is the same in all the proposals.

The annual cost of taking agricultural land is more difficult to estimate since actual production figures from farms are not available. The Ministry of Agriculture suggest that the average annual yield from Bramford and Belstead might be £60 per acre. The annual yield from the poorer quality agricultural land at Martlesham might be £35 per acre. These are gross and not net figures. Table B3 shows the annual gross yield that would be lost for each of the alternatives considered.

**B1 Existing land utilisation of approximate area for alternative 1 (acres)**

| | Bramford District | Belstead District | Total |
|---|---|---|---|
| 1. Cereals | 2300 | 2325 | 4625 |
| 2. Root crops, potatoes, beans, peas, etc. | 75 | 175 | 250 |
| 3. Open pasture, grazing land | 1000 | 880 | 1880 |
| Agricultural uses sub-total | 3375 | 3380 | 6755 |
| 4 Woodland | 125 | 760 | 875 |
| 5 Existing built up area industry, roads, residential and other | 1025 | 710 | 1735 |
| 6 Allotments, gardens and small holdings | 50 | 10 | 60 |
| 7. Waste land | 25 | 50 | 75 |
| Non-agricultural uses sub-total | 1225 | 1520 | 2745 |
| Total | 4600 | 4900 | 9500 |

**B2 Cost of agricultural land acquisition for each alternative**

| | Cost of land acquisition in £ thousands | | | |
|---|---|---|---|---|
| Alternative | Belstead | Bramford | Martlesham | Total |
| 1 | 1020 | 1020 | — | 2040 |
| 2 | 1020 | — | 614 | 1634 |
| 3 | 1020 | — | 614 | 1634 |
| 4 | — | 1020 | 614 | 1634 |
| 5 | 1020 | — | 650 | 1670 |
| 6 | 660 | — | 878 | 1638 |
| 7 | 660 | 660 | 364 | 1684 |

**B3 Annual gross yield of agricultural land required for each alternative**

| | Annual gross yield in £ thousands | | | |
|---|---|---|---|---|
| Alternative | Belstead | Bramford | Martlesham | Total |
| 1 | 204 | 204 | — | 408 |
| 2 | 204 | — | 77 | 281 |
| 3 | 204 | — | 77 | 281 |
| 4 | — | 204 | 77 | 281 |
| 5 | 204 | — | 87 | 291 |
| 6 | 132 | — | 119 | 251 |
| 7 | 132 | 132 | 42 | 306 |

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Printed in England for Her Majesty's Stationery Office by St. Clements Fosh & Cross Ltd., London Dd. 136208 K20 11/67